

--10.

(Amended) The image forming apparatus of claim 9 wherein the bias voltage applying means is a constant current power source. --

Q15  
Wmd  
--11.

(Amended) The image forming apparatus of claim 9 wherein the cleaning roller is insulated in lateral direction in the part which is located beyond the part corresponding to the area effectively charged by said charging unit. --

Q16  
--13.

(Amended) The image forming apparatus of claim 9 wherein the cleaning roller is conductive in its lateral direction in the part corresponding to the area in which the surface of said photoreceptor is effectively charged by said charging unit and is simultaneously insulated in the part beyond both edges of the part corresponding to said effectively charged area. --

#### REMARKS

Applicants have carefully considered the matters raised by the Examiner in the outstanding Office Action but remain of the opinion that patentable subject matter is present. Applicants respectfully request reconsideration of the Examiner's position based on the above amendments and the following remarks.

At the outset, it is noted that the Examiner indicated that claims 1-15 would be allowable if rewritten or amended to overcome the rejections under 35 USC 112, second paragraph. It is deemed that the amendments made to the claims, as well as the other amendments which are contained herein, fully address the Office Action and that the case is now in condition for allowance. Each one of the points raised in the Office Action will be addressed in turn in the following paragraphs.

The drawings have been objected to because the written description refers to "development means 4" on page 31, lines 11-12 but no reference to character 4 appears in the drawings. Obviously, this is a typographical error and the development means should have been referred to as "development unit 13". Support for this amendment can be found on page 23, line 21.

Figure 1(b) had been objected to because a reference character 28 appears in Figure 1(b) but no reference is made to No. 28 in the written description. Reference character 28 in Fig. 1(b) refers to the control unit for the voltage applying means 22. On line 8 of page 41, the control unit was incorrectly labeled 27. As can be seen on page 32, lines 17-21, reference character 27 refers to the pressing means. This is an obvious typographical error and the written description has been corrected on page 41, line 8, to refer to the control unit as 28.

Figures 6(a), 6(b), 7(a), 7(b), 7(c), and 8 had been objected to because none of the reference characters that appeared in those drawings were in the written description. In fact, the only reference to Figures 6(a)-8 was in the Brief Description of the Drawings. Figures 6(a)-8 have been cancelled herein and reference to these drawings has been deleted from the Specification.

Because Figures 6(a)-8 have been cancelled, Figures 9(a)-9(c) and 10(a)-10(f) have been renumbered to 6(a)-6(c) and 7(a)-7(f), respectively. Likewise, the written description, both in the Brief Description of the Drawings as it appears on page 19 and the written description on page 59, have been amended to reflect the renumbering of old Figures 9(a)-9(c) and 10(a)-10(f).

Figures 9(a)-9(c), renumbered Figures 6(a)-6(c) had been objected to as containing reference sign 1 while the written description did not contain a reference to character 1. Character 1 is clearly the toner and page 24, line 6, has been amended herein to insert "1" after the word "toner".

Figures 10(a)-10(f), renumbered Figures 7(a)-7(f), have been objected to because the drawings contained reference characters 2, 3-1, 3-2, and 3-3 but such reference characters were not referred to in the written description. These drawings have been amended herein to replace the objected-to reference characters with the

reference characters that were used in the written description. Specifically, character 2 is the photoreceptor and has been replaced with the number 10, 3-1 is the cleaning blade and has been replaced with reference character 23, 3-2 is the cleaning roller and has been replaced with reference character 21. Reference character 3-3 is a brush roller which is referred to on page 64 of the Application. The drawings have been amended to insert the number 29 for reference character 3-3 and the Specification has been amended on page 64 to insert the number 29 after the term brush roller.

Figure 5 was objected to because reference character 33 was indicated as a sectional view. Figure 5 has been amended herein to delete the crosshatching from reference 33.

The Abstract of the Disclosure had been objected to for including legal phraseology. It has been revised and is attached hereto to delete legal phraseology.

The disclosure had been objected to because, on page 31, line 17, reference character 82 was used in place of reference character 21. Line 17 on page 31 has been corrected herein to replace reference character 82 with reference character 21 as suggested by the Examiner.

The Examiner also requested that we check the Specification for any additional errors. It was noted that, in Figure 5 and on pages 43-46 and 54, reference 30 was used to refer to cleaning roller 21. Thus, correction has been made to these pages as well as to Figure 5 to change "30" to "21".

Also, on page 176, a typographical error was noted in the heading of the Table in that the Table was referred to as Table "4-4-2" when, in fact, it should have been referred to as Table 4-2. This is an obvious typographical error which has been corrected herein.

In Paragraph 7 of the Office Action, the Examiner had a number of informalities in the claims wherein no antecedent basis was provided for a number of terms. The claims have been amended herein to provide the antecedent basis as suggested by the Examiner in Paragraph 7.

In Paragraph 8 of the Office Action, the Examiner rejected the claims under 35 USC 112, second paragraph. Each one of the rejections will now be addressed in turn.

In line 22 of claim 1, the term "said latent image holding member" was objected to because the claim contained no antecedent basis for this phrase. The "latent image holding member" is the photoreceptor, therefore, line 22 of claim 1 has been amended to change "said latent image holding member" to "said photoreceptor". Such amendment is believed to be an obvious typographical error. In line 28 of claim 1, the phrase "the standard state" has been objected to because of no antecedent basis. The claim has been revised to "a standard state", since this is the first time that the standard state is referred to in the claim.

Claim 2 had been objected to because there was no antecedent basis for "the contact load". Claim 2 has been amended to change "the control load" to "a contact load".

Claim 4 had been objected to as providing no antecedent basis for "the external agent" and "the transfer zone". Claim 4 has been amended to use the article "an" and "a" to refer to both the external agent and the transfer zone. With respect to the "latent image holding member", as it appears in line 21 of claim 4, this term has been amended, as it was in claim 1, to refer to the photoreceptor. Some additional amendments were made to claim 4 merely to provide antecedent basis for the terms. These additional amendments are deemed to be simply grammatical in nature.

Claim 5 had been objected to on the basis that there was no antecedent basis for the "control mechanism" and because there was a "." that appeared in the middle of the claim. Claim 5 has been amended herein to delete the second sentence and to make it dependent upon claim 4. Claim 4 provides the antecedent basis for the control mechanism.

Claim 6 had been rejected on the basis that there was no antecedent basis for a number of the terms and because it contained two sentences. Claim 6 has been amended herein to make it depend upon claim 4 and the second sentence in claim 6 has been deleted. Claim 4 provides the antecedent basis for the terms in claim 6.

Claim 9 had been rejected on the basis that several terms do not have an antecedent basis. Claim 9 has been amended herein to provide the antecedent basis for these terms. Additionally, the term "latent image holding member" has been replaced with "photoreceptor". These amendments are deemed to be merely clerical in nature.

Claim 10 has been amended herein to refer to "the bias voltage applying means" which is referred to in claim 9.


With respect to claims 11 and 13, both these claims have been amended herein to refer to "the cleaning roller". The cleaning roller is the one which is referred to in claim 9.

In view of the foregoing and the enclosed, it is respectfully submitted that the Application is now in condition for allowance, and such action is respectfully requested. Should any extensions of time or fees be necessary in order to maintain this Application in pending condition, appropriate requests are hereby made and authorization is given to debit account #02-2275.

Respectfully submitted,

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Encl: One sheet of red-marked Fig. 5  
One sheet of red-marked Figs. 6(a), 6(b) and 6(c)  
One sheet of red-marked Figs. 7(a), 7(b), 7(c), 7(d), 7(e), 7(f),  
One sheet comprising Figs. 4 and 5  
One sheet comprising Figs. 6(a), 6(b) and 5(c)  
One sheet comprising Figs. 7(a), 7(b), 7(c), 7(d), 7(e) and 7(f)  
One page of Abstract of the Disclosure  
Marked-up Specification pages 18-19, 23-24, 26, 31, 41, 43-46,, 45, 46, 54, 59, 64 and 176.  
Marked-up copies of Amended Claims 1, 2, 4-6, 9-11 and 13  
Return receipt post-card.



1st and 2nd Paragraphs on page 19:



[Fig. 9(a) to 9(c)] Figs. 6(a) to 6(c) are each a view showing an elastic/brush roller cleaning system.

[Fig. 10(a) to 10(f)] Figs. 7(a) to 7(f) are each a view of a structure in which each cleaning member is paired.

Bridging pages 23 and 24:

Said image forming apparatus comprises drum-shaped photoreceptor 10 which is rotationally driven, charging unit 11 which uniformly charges the surface of said photoreceptor 10, exposure unit 12 which exposes the surface of said photoreceptor 10 charged by said charging unit 11, development unit 13 which visualizes the electrostatic latent image formed by said exposure unit 12 employing a developer comprising a toner, a transfer unit 14 which transfers the toner image formed on photoreceptor 10 in the transfer zone onto a recording material, separation unit 15 which separates said recording material which comes into close contact with photoreceptor 10, and cleaning unit 20 which removes the toner 1 on photoreceptor 10 which passes through the transfer zone.

1st Paragraph, page 26:

In Fig. 1(a), numeral 24 is a scraper provided on cleaning roller 21, which recovers toner on cleaning roller 21. The recovered toner is conveyed to development unit 13 employing recovery roller 25 which is arranged to maintain parallel to cleaning roller. The recovered residual toner is conveyed to development unit [12] 13, employing the recovery roller 25 and reused.

2nd Paragraph on page 31:

Further, other than said scraper, it is possible to employ rollers as well as brushes as the removal means. Toner recovered by scraper 24 is charged into development [means 4] unit 13 together with toner recovered by cleaning blade 23, employing recycling means and reused. A plurality of removal means such as scraper may be provided. When cleaning ability of cleaning roller is enhanced, recovery is preferably carried out employing a plurality of scrapers, since the toner adheres tightly to cleaning roller [82] 21 under an electrostatic force.

1st and 2nd Paragraphs, page 41:

On the other hand, a bias voltage in response to the volume of the electric current controlled by control unit [27] 28 is applied to cleaning roller 21 constituting cleaning unit 20, employing a bias voltage applying means, and said cleaning roller 21 is charged to the opposite polarity (for example, positive polarity) of the residual toner on photoreceptor 10 which has passed through the transfer zone, whereby most residual toner on photoreceptor 10 is removed. After the residual toner passing through cleaning roller 21 is mechanically removed by cleaning blade 23, photoreceptor 10 is recharged by charging unit 11, and said operation is repeated. Further, recovered residual toner is conveyed to development unit [12] 13, employing recovery roller 25 and reused.

2nd Paragraph, page 43:

As shown in Fig. 5, in the image forming apparatus of the present invention, it is preferable that cleaning roller [30] 21 constituting cleaning unit 20 is comprised of conductive portion 31 and insulated portion 32 which are located beyond both ends of said conductive portion 31 in the lateral direction.

1st, 2nd and 3rd Paragraphs, page 44:

Specifically, in said cleaning roller [30] 21, the portion corresponding to effective charging area W3 of charging unit 11, is comprised of a conductive or semi-conductive material, and at the same time, a part beyond the part corresponding to effective charging area W3 is comprised of insulating materials. Further, in order to minimize discharge from conductive portion 31, cleaning roller constituting materials, each of which has different surface resistance, is joined via, for example, insulating buffer member 33.

The surface resistance of insulated portion 32 is preferably at least  $10^{11} \Omega\text{cm}$ , and is more preferably at least  $10^{13} \Omega\text{cm}$ . By adjusting the surface resistance to the preferred range, it is possible to assuredly minimize discharge due to the electric current applied by cleaning roller [30] 21 as well as charge accumulation on photoreceptor 10.

Said surface resistance is obtained based on  $V/IW$ , wherein V is the constant voltage applied to cleaning roller [30] 21 when said cleaning roller is provided on a flat conductive board, I is the electric current running from said flat board, and W is the contact width of said flat board and cleaning roller [30] 21.

3rd Paragraph, page 45:

Further, since insulated portion 32 is formed on cleaning roller [30] 21, it is possible to minimize occurrence in which toner, which has been recovered, is scattered on the sides of photoreceptor 10 and adheres onto said photoreceptor 10.

1st Paragraph, page 46:

As noted above, in the image forming method of the present invention, in addition to mechanical cleaning by cleaning blade 23, electrostatic cleaning by cleaning roller [30] 21 is conducted. As a result, without an increase in contact load of cleaning blade to photoreceptor 10, it is possible to obtain higher cleaning performance without fluctuations over an extended period of time. Therefore, marked effects are exhibited by employing organic photoreceptors which have not been employed in the conventional cleaning units, due to the fact that it was impossible to increase contact load of cleaning blade 23 and to still obtain stabilized cleaning performance over an extended period of time.

1st Paragraph, page 54:

As noted in the image forming method of the present invention, in addition to mechanical cleaning obtained by employing cleaning blade 23, electrostatic cleaning obtained by employing cleaning roller [30] 21 is practiced. As a result, without an increase in contact load of cleaning blade on photoreceptor 10, it is possible to exhibit stable and high cleaning performance over an extended period of time. Therefore, marked effects are exhibited by employing organic photoreceptors which have not been employed using the conventional cleaning unit, due to the fact that it is impossible to increase contact load of cleaning blade 23 and to obtain stable cleaning performance over an extended period of time.

1st Paragraph, page 59:

[Figs. 10(a) to 10(f)] Figs. 7(a) to 7(f) each is a view of a structure in which each cleaning member is paired.

2nd Paragraph, page 64:

Said system is constituted in such a manner that elastic roller and brush roller 29 come into contact with the photoreceptor and the toner on said photoreceptor is mechanically removed.

Table 4-2

	First Cleaning Member	Second Cleaning Member	Toner	Insufficient Cleaning	Image White Streaks	Image Black Streaks	Remarks
Example 4-1	A (55%)	E (90%)	1	good to the 200,000th copy	none	none	
Example 4-2	C (95%)	E (90%)	1	good to the 200,000th copy	none	none	
Example 4-3	E (90%)	D (30%)	1	good to the 200,000th copy	none	none	
Example 4-4	B (75%)	A (55%)	1	good to the 200,000th copy	none	none	
Comparative Example 4-1	D (30%)	C (95%)	1	occurred at about the 120,000th copy	occurred at about the 140,000th copy	occurred at about the 120,000th copy	
Comparative Example 4-2	F (40%)	E (90%)	1	occurred at about the 140,000th copy	occurred at about the 150,000th copy	occurred at about the 140,000th copy	
Example 4-5	C (95%)	E (90%)	2	good to the 200,000th copy	slightly occurred at about the 150,000th copy	none	interior apparatus staining due to scattering, generation of white streaks due to stained charging pole

Figures in parentheses are the toner removal ratio.



MARKED-UP AMENDED CLAIMS

-- 1. <sup>(Amended)</sup> An image forming apparatus, comprising:

a rotationally driven photoreceptor;

a charging device to electrically charging the  
photoreceptor;

an exposing device to imagewise exposing the  
photoreceptor so that a latent image is formed on the  
photoreceptor;

a developing device to develop the latent image with  
toner so that a toner image is formed on the photoreceptor;

a transfer device to transfer the developed image to a  
recording material; and

a cleaning unit which removes residual toner on said  
photoreceptor which has passed a transfer zone in which a  
toner image formed on said photoreceptor is transferred to a  
recording material in which  
said cleaning unit comprises a cleaning roller which is  
disposed so as to come into contact with <sup>a</sup> ~~the~~ surface of said  
photoreceptor, a bias voltage applying means which applies a  
bias voltage to said cleaning roller, and a flat board-shaped  
cleaning blade comprised of an elastic body which is disposed  
so that <sup>a</sup> ~~the~~ leading edge of said cleaning blade comes into



contact with the surface of said ~~latent image holding member~~ <sup>photoreceptor</sup>  
downstream from said cleaning roller with respect to ~~the~~ <sup>a</sup>  
movement direction of said photoreceptor, and  
said cleaning blade is supported rotatably around  
predetermined rotationally driven center axis O parallel to  
~~the~~ <sup>a</sup> rotational axis of said photoreceptor so that said  
cleaning blade is rotationally driven from ~~the~~ <sup>a</sup> standard state  
in which the leading edge comes into contact with the surface  
of said photoreceptor while its total shape is not deformed  
and subsequently, is subjected to a working state while its  
entire body is curved, and  
the position of said rotationally driven center axis O is set  
so that said cleaning blade, in ~~its~~ <sup>the</sup> standard state, satisfies  
the Conditions (1) and (2):

Condition (1): in the cross-section perpendicular to  
the rotational axis of said photoreceptor, straight line T  
drawn between contact position P of the leading edge of said  
cleaning blade with said photoreceptor and said rotationally  
driven center axis O is positioned between tangential line N  
at said contact position P and said cleaning blade, and

Condition (2): in the cross-section perpendicular to  
the rotational axis of said photoreceptor, contact angle  $\theta$  of  
said cleaning blade with respect to the tangential line of

said photoreceptor at said contact point P is from 0 to 30 degrees. --

(Amended)

2. <sup>^</sup> The image forming apparatus of claim 1 wherein ~~the~~  
<sup>has a contact load</sup>  
~~contact load on~~ said cleaning blade <sup>is</sup> from 5 to 50 g/cm. --

(Amended)

4. <sup>^</sup> An image forming apparatus, comprising:

a rotationally driven photoreceptor;

a charging device to electrically charging the  
photoreceptor;

an exposing device to imagewise exposing the  
photoreceptor so that a latent image is formed on the  
photoreceptor;

a developing device to develop the latent image with  
toner so that a toner image is formed on the photoreceptor  
employing toner comprising a lubricant as <sup>an</sup> ~~the~~ external agent;

a transfer device to transfer the developed image to a  
recording material in <sup>a</sup> ~~the~~ transfer zone; and

a cleaning unit which removes residual toner on said  
photoreceptor which has passed said transfer zone, wherein

said cleaning unit comprises a cleaning roller which is disposed so as to come into contact with <sup>a</sup>the surface of said photoreceptor, a bias voltage applying means which applies a bias voltage to said cleaning roller, and a flat board-shaped cleaning blade comprised of an elastic body which is disposed so that <sup>a</sup>the leading edge of said cleaning blade comes into contact with the surface of said <sup>photo receptor</sup>~~latent image holding member~~ downstream from said cleaning roller with respect to <sup>a</sup>the movement direction of said photoreceptor, and which comprises a control mechanism comprising a specified toner image forming function which forms a toner image for maintaining a blade effect to maintain <sup>a</sup>the desired cleaning effect of said cleaning blade which reaches a cleaning zone employing said blade after passing said transfer zone. --

(Amended)

4

-- 5. <sup>a</sup>The image forming apparatus of claim 1 wherein the control mechanism is capable of allowing said toner image for maintaining a blade effect to reach said cleaning zone, in which said cleaning blade is employed, by decreasing the cleaning effect obtained by said cleaning roller. ~~In this case, when said toner image for maintaining the blade effect passes the cleaning zone in which said cleaning roller is employed, it is preferable that the cleaning effect obtained~~

~~employing said cleaning roller is decreased by decreasing or  
eliminating the bias voltage which is applied to said  
cleaning roller.~~ --

-- 6. <sup>4</sup>  
(amended) The image forming apparatus of claim 1 wherein the  
specified toner image forming function of said control  
mechanism controls the operation of said image forming unit  
so that said toner image for maintaining the blade effect is  
formed at every specified image forming frequency.  
~~Further, said bias voltage applying means is comprised of a  
constant current power source.~~ --

-- 9. <sup>(Amended)</sup> An image forming apparatus, comprising:  
^ a rotationally driven photoreceptor; <sup>having an axis</sup>

a charging device to electrically charge the photoreceptor which is arranged so as to face said photoreceptor while maintaining parallel to the axis;

an exposing device to imagewise exposing the photoreceptor so that a latent image is formed on the photoreceptor;

a developing device to develop the latent image with toner so that a toner image is formed on the photoreceptor employing toner comprising a lubricant as <sup>an</sup> ~~the~~ external agent;

a transfer device which is arranged to face the photoreceptor while maintaining parallel to the axis and transfers a toner image on the photoreceptor onto a recording material in <sup>a</sup> ~~the~~ transfer zone; and

a cleaning unit which removes the toner on said photoreceptor which passes through said transfer zone, in which said cleaning unit comprises a cleaning blade which comes into contact with <sup>a</sup> ~~the~~ surface of said photoreceptor, a cleaning roller which comes into contact with the surface of said <sup>photoreceptor</sup> ~~latent image holding member~~ upstream with respect to the movement direction of said photoreceptor and is arranged to

maintain parallel to the axis of said photoreceptor, and a bias voltage applying means which applies a bias voltage to said cleaning roller, is characterized in that formulas (1) and (2) described below are satisfied;

Formula (1)  $W2 < W1$

Formula (2)  $|W3 - W1| \leq 30$  (in mm)

wherein  $W1$  is <sup>an</sup> ~~the~~ effective cleaning area obtained by said cleaning roller in the axis direction of said photoreceptor,  $W2$  is <sup>an</sup> ~~the~~ effective transferring area of said transfer <sup>device</sup> ~~unit~~, and  $W3$  is <sup>an</sup> ~~the~~ effective charging area of said charging <sup>device</sup> ~~unit~~. --

- (Amended)
- 10. <sup>^</sup> The image forming apparatus of claim 9 wherein the ~~cleaning unit comprises a bias voltage applying means which~~ is a constant current power source.

- (Amended)
- 11. <sup>^</sup> The image forming apparatus of claim 9 wherein the ~~cleaning unit comprises a cleaning roller which~~ is insulated in lateral direction in the part which is located beyond the part corresponding to the area effectively charged by said charging unit.

-- 13. <sup>(Amended)</sup>~~The~~ image forming apparatus of claim 9 wherein the  
~~cleaning unit comprises a cleaning roller which~~ is conductive  
in its lateral direction in the part corresponding to the  
area in which the surface of said photoreceptor is  
effectively charged by said charging unit and is  
simultaneously insulated in the part beyond both edges of the  
part corresponding to said effectively charged area. --



FIG. 4

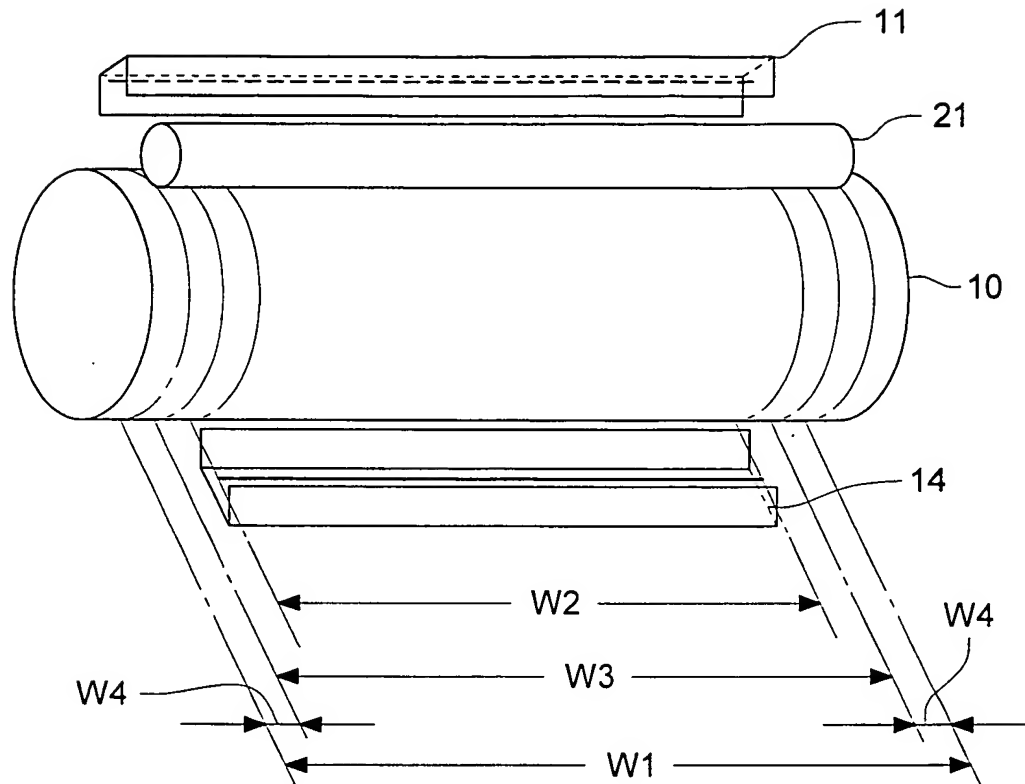
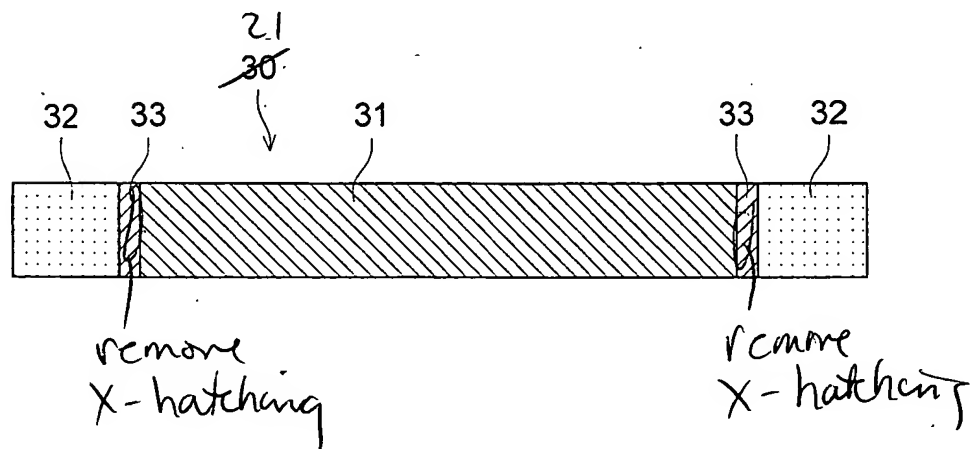


FIG. 5



approved by 3/3/03





FIG. 9(a)  
*Amended*

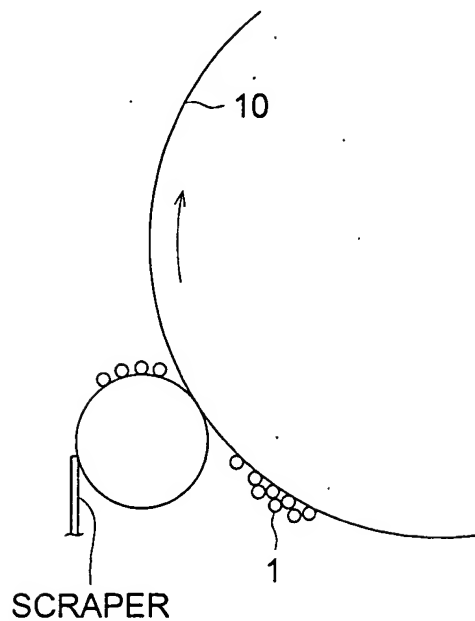


FIG. 9(b)  
*Amended*

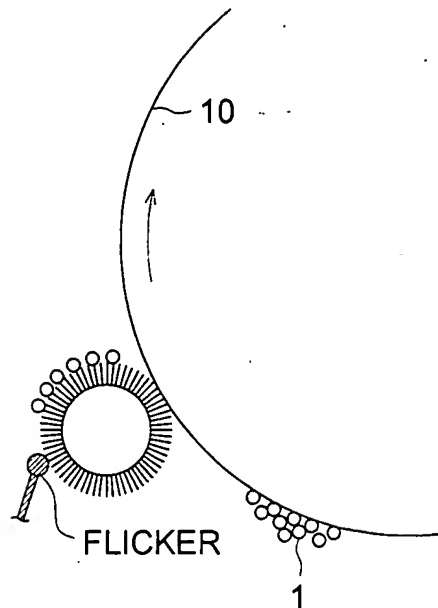
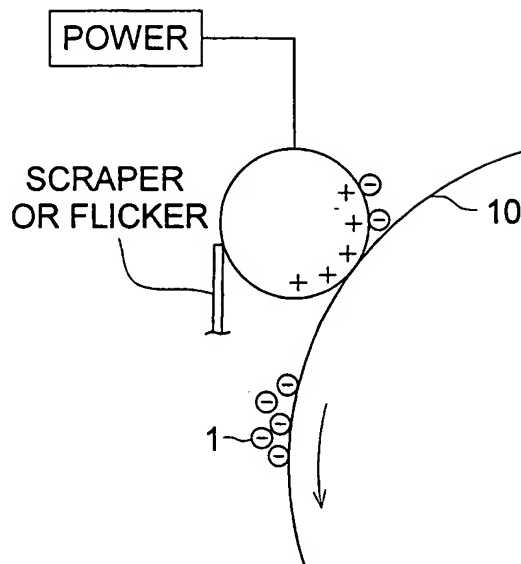
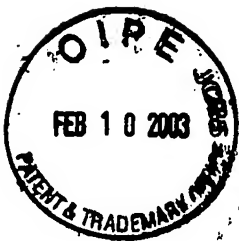
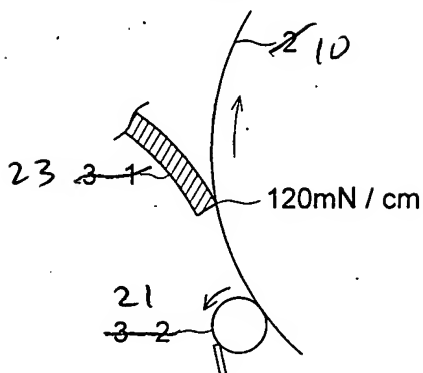


FIG. 9(c)  
*Amended*

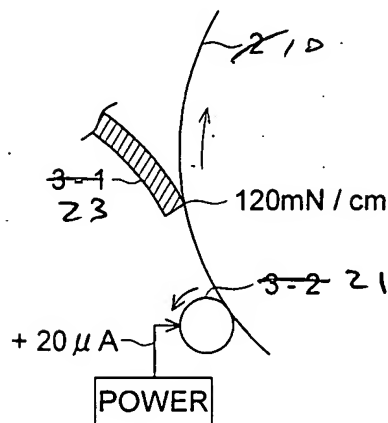




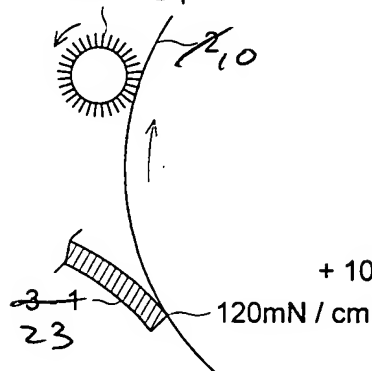
7  
FIG. 10 (a)  
*Amended*



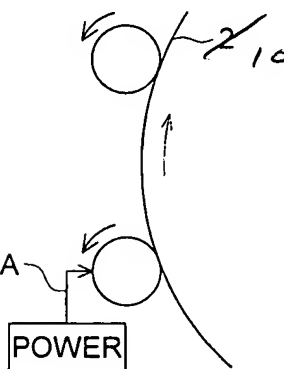
7  
FIG. 10 (b)  
*Amended*



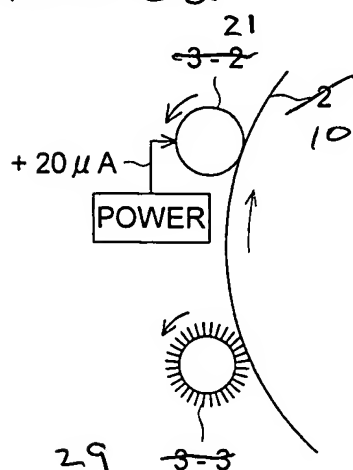
7  
FIG. 10 (c)  
*Amended*



7  
FIG. 10 (d)  
*Amended*



7  
FIG. 10 (e)  
*Amended*



7  
FIG. 10 (f)  
*Amended*

